QUADRATIC APPLICATIONS - Key

1) A. $t = \frac{-16}{2(-16)} = \frac{-16}{-32} = \boxed{\frac{1}{2} \text{ sec}}$

B. $h(\frac{1}{2}) = -16(\frac{1}{2})^2 + 16(\frac{1}{2}) + 480 = \boxed{484 \text{ ft}}$

C. Graphing calc 

or $x = \frac{-16 \pm \sqrt{30976}}{2(-16)} = \frac{-16 \pm 176}{-32}$

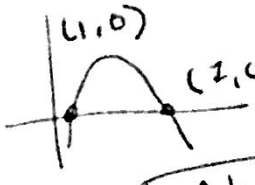
$\boxed{x = 6 \text{ sec}}$

2) A. 

or $x = \frac{-128 \pm \sqrt{16384}}{2(-16)} = \frac{-128 \pm 128}{-32} \Rightarrow$ ~~0~~ or $\frac{-256}{-32}$

$\boxed{x = 8 \text{ sec}}$

B. $112 = -16t^2 + 128t \Rightarrow 0 = -16t^2 + 128t - 112$. Now solve



or $x = \frac{-128 \pm \sqrt{9216}}{2(-16)}, \frac{-128 \pm 96}{-32}$

$\boxed{\text{~~After~~ At 1 second and at 7 seconds}}$

C. $t = \frac{-128}{2(-16)} = \boxed{4 \text{ sec}}$

D. $-16(4)^2 + 128(4) = \boxed{256 \text{ ft high}}$

3) $x = \frac{-(-32)}{2(-16)} = \frac{32}{-32} = -1$ $h(-1) = -16(-1)^2 + 32(-1) + 5 = \boxed{21 \text{ feet}}$

21 ft > 20 ft $\Rightarrow$ Yes, you can reach the ledge

4) A. 49 ft

B. $h = 0$ ft

C. $h = -16t^2 + vt + 5 \Rightarrow h(t) = -16t^2 + 0t + 49 = -16t^2 + 49$

Now find the solutions

or $x = \frac{0 \pm \sqrt{3136}}{2(-16)}$, $\frac{\pm 56}{-32} = \pm 1.75$ sec $\Rightarrow$ **1.75 sec**

5) $h(t) = -16t^2 + 8t + 24$ Find solutions

or $x = \frac{-8 \pm \sqrt{1600}}{2(-16)} = \frac{-8 \pm 40}{-32} \Rightarrow \frac{-48}{-32} =$ **1.5 sec**

$\Rightarrow \frac{32}{-32}$

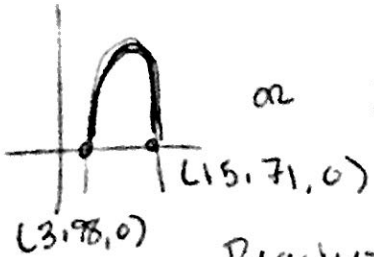
6) $h(t) = -16t^2 + 35t$

height $\rightarrow$ $80 = -16t^2 + 35t \Rightarrow 0 = -16t^2 + 35t - 80$. Now solve

No real solutions

$\Rightarrow$ It won't. The max height of the projectile is < 80 ft

7) $1000 = -16t^2 + 315t \Rightarrow 0 = -16t^2 + 315t - 1000$. Now solve



or $x = \frac{-315 \pm \sqrt{41625}}{2(-16)} = \frac{-315 \pm 204.02}{-32}$

Reaches 1,000 ft at 3.98 and 15.71 sec.
Above 1000 ft in between those times
$\Rightarrow 15.71 - 3.98 \Rightarrow$ **11.73 seconds**

8) A. $\boxed{2w + 2l = 180 \text{ ft}}$ or $2(l+w) = 180$

$\Downarrow$

B. $A = lw$ $\qquad w = \frac{180 - 2l}{2} = 90 - l$

$A = l(90 - l) = \boxed{90l - l^2}$

C. $l = \frac{-90}{2(-1)} = \frac{-90}{-2} = 45$ ft.

$w = 90 - l = 90 - 45$ ft

$\boxed{45 \times 45 \text{ ft}}$

9) Fence used $= 600 = 3x + 2y \Rightarrow x = \frac{600 - 2y}{3} = 200 - \frac{2}{3}y$

(Note: You could also solve for y instead!)

$A = xy$

$A = (200 - \frac{2}{3}y)y = 200y - \frac{2}{3}y^2$

$y = \frac{-200}{2(-\frac{2}{3})} = \frac{-200}{-\frac{4}{3}} = \frac{200 \cdot 3}{4} = 150$ meters

$x = 200 - \frac{2}{3}(150) = 200 - 100 = 100$ meters

$\boxed{100 \times 150 \text{ meters}}$

10) A. $R = x \cdot p = x\left(-\frac{1}{3}x + 40\right) = \boxed{-\frac{1}{3}x^2 + 40x}$

B $x = \frac{-40}{2\left(-\frac{1}{3}\right)} = \frac{-40}{-\frac{2}{3}} = \frac{40 \cdot 3}{2} = \boxed{60 \text{ units}}$

C. $R = -\frac{1}{3}(60)^2 + 40(60) = \boxed{\$1200}$

D. $p = -\frac{1}{3}(60) + 40 = \boxed{\$20 \text{ per unit}}$

11) $x + y = 8$ Maximize xy

$x = 8 - y \Rightarrow xy = (8-y)(y) = 8y - y^2$

$y = \frac{-8}{2(-1)} = \frac{-8}{-2} = 4 \qquad x = 8 - 4 = 4$ $\boxed{4 \text{ \& } 4}$

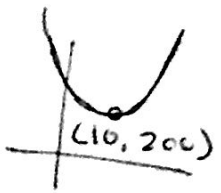
12) $x + y = 20$ Minimize $x^2 + y^2$

$y = 20 - x$

(or solve for x... it doesn't matter!)

$x^2 + (20-x)^2 = x^2 + 400 - 40x + x^2$

$\Rightarrow 2x^2 - 40x + 400$



$x = \frac{-(-40)}{2(2)} = \frac{40}{4} = 10$

$y = 20 - 10 = 10$ $\boxed{10 \text{ \& } 10}$